

CLAIMS

What is claimed is:

1. An apparatus for providing a tactile sensation to a sensing body part in relation to a virtual state signal, said apparatus comprising at least one vibrotactile unit, wherein each unit comprises:

a mass-moving actuator comprising a shaft and an eccentric mass mounted on said shaft, said mass-moving actuator rotating said shaft;

fastening means for holding said mass-moving actuator in relation to said sensing body part for transmitting vibrations to said sensing body part; and

wherein said apparatus further comprises a signal processor for interpreting said virtual state signal to produce an activating signal and transmitting said activating signal to said mass-moving actuator for activating said mass-moving actuator.

2. An apparatus according to Claim 1, wherein said fastening means comprises a casing containing said vibrotactile unit.

3. An apparatus according to Claim 1, wherein said activating signal provides varying levels of activating said mass-moving actuator for varying the rotation of said shaft.

4. An apparatus according to Claim 1, wherein said mass-moving actuator is an electric motor and said apparatus comprises electrical connection means connecting said electric motor to said signal processor.

5. An apparatus according to Claim 1, wherein said fastening means comprises means for fastening to a portion of a hand.

6. An apparatus according to Claim 5, wherein said portion of a hand is the dorsal side of a finger.

7. An apparatus according to Claim 5, wherein said portion of a hand is the metacarpus.

8. An apparatus according to Claim 1, wherein said eccentric mass is pie-shaped.

9. An apparatus according to Claim 1, comprising a plurality of vibrotactile units.

10. An apparatus according to Claim 9, wherein said signal processor produces multiple activating signals for individually activating each vibrotactile unit of said plurality of vibrotactile units to produce a complex tactile sensation.

11. An apparatus for providing a tactile sensation to a sensing body part in relation to a state of a measured body part, said apparatus comprising at least one vibrotactile unit, wherein each unit comprises:

a mass-moving actuator comprising a shaft and an eccentric mass mounted on said shaft, said mass-moving actuator rotating said shaft; and

fastening means for holding said mass-moving actuator in relation to said sensing body part for transmitting vibrations to said sensing body part; and

wherein said apparatus further comprises:

a state sensor for measuring the state of said measured body part and generating a state signal; and

a signal processor for receiving said state signal to produce an activating signal and transmitting said activating signal to said mass-moving actuator for activating said mass-moving actuator.

12. An apparatus according to Claim 11, wherein said fastening means comprises a casing containing said vibrotactile unit.

13. An apparatus according to Claim 11, wherein said activating signal provides varying levels of activating said mass-moving actuator for varying the rotation of said shaft.

14. An apparatus according to Claim 13, wherein said mass-moving actuator is a variable speed electric motor.

15. An apparatus according to Claim 13, wherein said fastening means comprises means for fastening to a portion of a hand.

16. An apparatus according to Claim 15, wherein said portion of a hand is the dorsal side of a finger.

17. An apparatus according to Claim 15, wherein said portion of a hand is the metacarpus.

18. An apparatus according to Claim 11, wherein said eccentric mass is pie-shaped.

19. An apparatus according to Claim 11, comprising a plurality of vibrotactile units, wherein said signal processor produces multiple activating signals for individually activating each vibrotactile unit of said plurality of vibrotactile units to produce a complex tactile sensation.

20. An apparatus according to Claim 11, wherein said apparatus has a plurality of state sensors, each state sensor for measuring the state of a different said measured body part.

21. An apparatus for providing a complex tactile sensation to a sensing body part in relation to a state signal, said apparatus comprising at least one vibrotactile unit, wherein each unit comprises:

a mass-moving actuator comprising a shaft and an eccentric mass mounted on said shaft, said mass-moving actuator rotating said shaft; and

fastening means for holding said mass-moving actuator in relation to said sensing body part for transmitting vibrations to said sensing body part;

wherein said apparatus further comprises a signal processor for interpreting said state signal to produce an activating signal and transmitting said activating signal to said mass-moving actuator for activating said mass-moving actuator.

22. An apparatus according to Claim 21, comprising a plurality of vibrotactile units, wherein said signal processor produces multiple activating signals for individually activating each vibrotactile unit of said plurality of vibrotactile units to produce said complex tactile sensation.

23. A method for providing a tactile sensation to a sensing body part in relation to a state signal, employing an apparatus comprising a vibrotactile unit, wherein said vibrotactile unit comprises:

a mass-moving actuator comprising a shaft and an eccentric mass mounted on said shaft, said mass-moving actuator rotating said shaft; said method comprising:

mounting said vibrotactile unit on a sensing body part;

interpreting said state signal to produce an activating signal; and

transmitting said activating signal to said mass-moving actuator for varying the rotation of said shaft to provide a tactile sensation to said sensing body part.

24. A method according to Claim 23, wherein said mounting comprises mounting each of a plurality of vibrotactile units on different said sensing body parts; and

said transmitting comprises transmitting individual activating signals to each of said vibrotactile units to produce a complex tactile sensation.